Bayesian Spatio-spectral Imaging of SN1006

The supernova remnant SN1006 has been extensively studied by various instruments and telescopes, due to its historical record, proximity, and brightness. To accurately study the properties of the remnant itself, it is essential to separate its emission from that of other sources in the field. Here, we present a spatio-spectral image reconstruction method based on information field theory which allows to effectively separate the signal into two components: diffuse emission and point-sources. Leveraging prior knowledge about the spatial and spectral correlation structure of these components, our method provides a detailed and denoised view of SN1006. To accelerate the imaging process, we initiate the image reconstruction using only a small spectral range and use this as the starting point for the subsequent full spatio-spectral reconstruction. We apply the method to the latest, merged Chandra data on SN1006, providing a high-quality visualization of its complex features.
Keywords: SN1006, information field theory, X-ray imaging, Bayesian imaging, spatio-spectral reconstruction, component separation